Space Weather Forecast

Issued on Tuesday, 20 June 2023 at 13:17 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate R1/R2 Radio Blackouts Likely through midweek. Latent daily slight chance of Minor Geomagnetic Storm G1.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been moderate over the past 24 hours, with X-ray flux showing occasional Common-class flares after an early impulsive peak of a low-end Moderate-class at 19/1214UTC from the southeastern solar horizon, probably tied to the arrival of a sunspot group here in the ensuing hours. At the very end of the period this was trumped by a longer-duration overlaid pair of flares from the aforementioned spot group and another in the southwest, eventually peaking at 20/1125UTC.

The number of sunspot regions has now likely reached double figures. Some of the regions also display rather large north-south extents, and may yet be partitioned into separate groups. The most significant region on the Sun in terms of complexity is now perhaps in the southwest, which is both congested and has grown rapidly in the past 24 hours - both possible markers for heightened activity here.

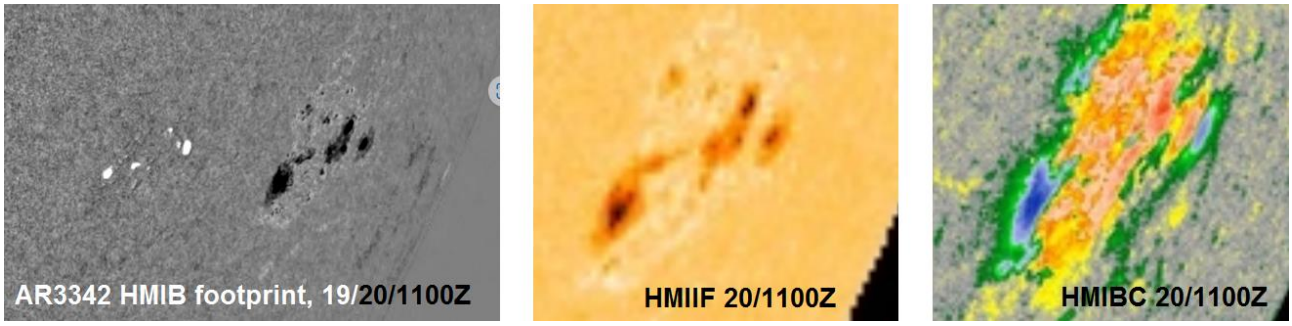

Figure 1: Helioviewer.org processed difference imagery in the visible footprint of one of the most active sunpot regions in the southwest of the Sun, showing marked growth in the 24-hour period (compare white spots with black). Also shown are its most recent appearance in visible and magnetic imagery, around the time of its Moderate-class X-ray flare.

There are numerous 'filaments' (arcs of plasma) on the Sun at present. Perhaps the most obvious event in the period was a large 'prominence' (arc of plasma on the Sun's edge) lift-off from the northwestern horizon around 20/0500UTC. This is clear in some subsequent satellite imagery and will be analysed in due course, although provisionally it is perhaps a little far above and ahead of the track of the Earth in its orbit for any effect to be felt here.

In addition to this, a rapidly emerging filament was then seen in near infrared imagery in the western solar hemisphere between 20/0400-0500UTC, although this did not culminate in any lift-off at the time of writing. Also of note was movement in filaments near the solar meridian in the southern solar hemisphere through the current UTC morning, although there is again no evidence

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of any resulting CME in satellite imagery.

At present then, there are no new confirmed Earth-directed CMEs.

Solar Wind / Geomagnetic Activity: The solar wind showed probable ongoing connection to a 'coronal hole' fast wind. Some upstream satellite data on the Sun-Earth line showed some slight discontinuities in its speed trace in the past 24 hours, especially at 19/1500UTC but also 19/2230UTC - but these are not very well reproduced in other satellites, and while these may be transitions between sources of fast winds, they are perhaps more likely to be variation within the current coronal hole.

The solar wind speed was mainly confined to slightly elevated levels, with a peak seen around the turn of the UTC day. The number of particles in the solar wind was within its typical background range throughout, while its magnetic field was also at background. The north-south component showed a small-scale erratic tendency, with no protracted periods spent anti-aligned with Earth's field (to greater effect).

The net effect of the above solar wind measures was for mostly quiet geomagnetic activity.
Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is likely to be Moderate through midweek, with slight depopulation of the frontside later this working week perhaps reducing this risk slightly.

Solar Wind / Geomagnetic Activity: The geomagnetic forecast carries lower-than-average confidence. Current mainly quiet conditions should give way to a latent daily slight chance of Minor Geomagnetic Storm G1, given a combination of an expected fast wind midweek, and also perhaps additive glancing influence from some minor peripheral CMEs.

Energetic Particles / Solar Radiation: No solar radiation storms are expected, with a daily slight chance of S1 or greater.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	15	10	15
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	60	60	55	50
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	10	10	10	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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